In the Specification:

Please replace the first paragraph as follows:

[0001] This is a continuation-in-part of Application No. 09/589,669 filed June 7, 2000, now U.S. Patent 6,327,859, which is a divisional application of Application No. 09/304,979 filed May 4, 1999, now U.S. Patent No. 6,114,620.

Please replace paragraph [0043] with the following paragraphs:

[0043] Preferred embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

[0043.1] Figure 1 shows a schematic cross section of a gas-phase-reactant-pulsed electric generator using a reaction stimulator in a V-channel geometry in one embodiment;

[0043.2] Figure 2 shows the device having a box structure;

[0043.3] Figure 3 shows a top view of a gas-phase-reactant, pulsed electric generator using a reaction stimulator in either flat or V-channel geometry;

[0043.4] Figure 4 shows a schematic top view of a gas-phase-reactant-pulsed electric generator using a reaction stimulator in either a flat or a V geometry with a single fuel port;

[0043.5] Figure 5 shows a gas-phase-reactant-pulsed electric generator with emitter surrounding the collector;

[0043.6] Figure 6 shows a schematic cross section diagram of gas-phase-reactant-pulsed electric generator using a reaction stimulator in a box geometry with a fuel port;

[0043.7] Figure 7 shows a transmission line used to drive the injector of the device of the present invention in one embodiment;

[0043.8] Figure 8 shows an example of composites placed in direct contact with the injector in one embodiment; and

[0043.9] Figure 9 shows a transmission line used to drive an emitter injector that is also a collector.

Please replace paragraph [0049] as follows:

[0049] In one embodiment, to energize the injector electrodes 107, 109, stored electric charges are switched into or injected into the injector 107, 108, 109. This switching causes a forward bias in the diode or injector, further causing the stored charges, in the form of hot electrons, to be dumped into the thin conductive metal electrode 109 which may also be a reaction surface. These dumped hot electrons desirably heat the electrode 109 and the reaction surface. In Figure 1, the reaction surface is shown as the same element as the electrode 109.

Please replace paragraph [0055] as follows:

[0055] An example of composites placed in direct contact with the injector is shown in Figure 8. The composite includes a layer of conductor 801 such as RuO2 with average thickness of order 10 nanometers or less, under a catalyst layer such as gold or platinum with thickness about 10 nanometers or less. Another example of catalysts includes an alumina spiked with vanadia or other catalysts. When an electrical pulse of order volts is applied to the electrodes 107 and 109, the fuel and oxygen adsorbed on the emitter 109, 802 is partially reacted into free radicals or reacted, and desorbed and delivered into the reaction volume. The reaction volume is shown in Figure 1 as the V-shaped channel region between the conducting surface 106 and the injector 107, 108, 109. The chemical reactions occur in this V-shaped channel region or on the reaction surfaces in contact with this region. The vibrationally excited reaction products may deposit a substantial fraction of their vibrational energy into an electron of a conducting surface 106, producing one or more hot electrons. The reaction products may also include, but are not limited to, photons, vibrationally excited molecules, and free radicals.

Please replace paragraph [0069] as follows:

[0069] A pulsed hot electron injection device of this invention includes the use of devices that produce either optical or electrical pulses with durations of order less than the phonon diffusion time in the target conductive layers. A method of the invention includes using the optical pulse impinging on a conducting surface 109 to create the pulse of hot electrons. A method of the invention includes using an electrical pulse to drive a semiconductor device or a metal-insulator-metal device 108 designed to inject or

transport hot electrons into its positive electrode 109, 801, 802 and to drive hot electrons from the electrode into the reacting surface 109, 802.

Please replace paragraph [0070] as follows:

[0070] The method includes using an optical source of photons as the primary source of energy to create hot electrons. The optical photon energy shall be sufficient to create hot carriers in the semiconductor 108 conduction band. The subsequent diffusion of carriers drives hot electrons into thin conductive layers 109, 801, 802 on a semiconductor substrate.

Please replace paragraph [0071] as follows:

[0071] ~~yyyyy1yyyyy1~~In one embodiment, the injector includes a semiconductor 108 which creates hot electrons from absorption of light from an external optical source. In this embodiment, an optical source with photon energy to create carriers in a semiconductor substrate 108 may be used to irradiate that semiconductor 108 and create hot electrons in its conduction band. The hot electrons so created in semiconductor 108 rapidly, e.g. within tens of picoseconds, diffuse into the reactive surfaces 109, 801, 802.

Please replace paragraph [0080] as follows:

[0080] Upon switching the electrical pulse into electrodes 107, 109, the hot electrons surmounting the diode Schottky barrier then flood the positive thin diode conductive electrode 109 with a pulse of hot electrons. The hot electrons equilibrate with the electrons in the electrode 109 and raise the instantaneous electron temperature.

Please replace paragraph [0081] as follows:

[0081] Similarly, in an embodiment having an electrically pulsed pn junction diode 107, 108, 109, the electrical pulse forward biases the diode. In this embodiment, the p side of the semiconductor is faced towards the reacting surface 801, 802. An electrical contact 109 is formed to the p type semiconductor so that the conducting electrode forms an almost ohmic junction. Composite catalysts 801, 802 are formed in contact with the electrical contact as the reaction surface.

Please replace paragraph [0083] as follows:

[0083] In one embodiment, electrically pulsed, solid state optically emitting diodes deliver up to 30 picosecond duration pulses of photons to a conductive surface. The diodes may illuminate the surface from behind, through substrates transparent to the radiation emitted by the diode, e.g., as appropriately chosen material 111, 108. E.g., a diode emitting 1 eV photons in the infra-red may pass through materials 111 with 1.5 eV or larger bandgap. Such materials include GaAs, alumina, or insulators.

Please replace paragraph [0087] as follows:

[0087] In one embodiment, the pulsed electric generator of the present invention includes the emitter 109, 801, 802, the energy collector 101, 102, 103, 104, 105, 106, 111, 112, and a reaction volume, which is the region between the emitter and the energy collector. In one embodiment, the emitter may be an integral part of the collector. In another embodiment, the emitter and the collector may be the same physical device.

Please replace paragraph [0090] as follows:

[0090] Referring to Figure 7, an initiator pulse is sent into a transmission line 700, 701, 702 to emitter electrodes 707, 709. When the emitter is also a collector and because of the pulsed reactions a pulse with more energy than the initiator pulse is received into the transmission line from the collector.

Please replace paragraph [0091] as follows:

[0091] The transmission line may also connect to collector electrodes. The emitter and collector may be the same physical device. Referring to Figure 9, an initiator pulse sent into the transmission line 900, 901, 902 propagates to its output electrodes 903, 904 and energize emitter electrodes ~~101~~ 102, 112. The emitter and collector electrode may be one and the same. However, the emitter stripline may be distinct from the collector output system.

Please replace paragraph [0097] as follows:

[0097] The emitter 3 is energized by emitter electrodes 4 and 6, and initiates the chemical reaction between fuel and oxidizer. Collisions of the vibrationally excited products with the collector wall 1 forward bias the semiconductor 8 that is connected to negative electrode 6 and positive electrode ~~7~~ 5. Electrode 5 is isolated from semiconductor 8 by an insulator 7.

Please replace paragraph [0104] as follows:

[104] In one embodiment, the emitter (Figure 6, 601, 602, 603) in the present invention may include a reaction surface to receive and use hot electrons and an injector (Figure 6, 601, 602) that generates and provides the hot electrons. The reaction surface (Figure 6, 603) includes a conductor and may optionally include layers of material. The layers of material may include conductors.

Please replace paragraph [0106] as follows:

[0106] When the injector, i.e., hot electron producer, 107, 108 (Figure 1) is a Schottky diode, the semiconductor provides electrons that surpass the Schottky barrier and travel from the semiconductor 108 into the conductor 109 that forms the electrode 109 of the diode. The electrode 109 and any materials 801, 802 (Figure 8) on the electrode form the reaction surface.

Please replace paragraph [0107] as follows:

[0107] When the injector is a pn junction diode, the p type semiconductor provides electrons from its conduction band. The electrons in this embodiment are minority carriers that travel into the ohmic or almost ohmic electrode 109 and come in contact with the valence band of the p type semiconductor 108. The electrode 109 and any materials 801, 802 on the electrode form the reaction surface.

Please replace paragraph [0108] as follows:

[0108] When the injector is a metal-semiconductor-metal or metal-insulator-metal device, one metal 107 is biased negative and the other metal 109 is biased positive. Electrons originating in the one metal 107 travel through the metal-insulator or metal-

semiconductor layer 108 and are driven into the other metal 109, biased positive, appearing as hot electrons in the metal 109 . The electrode biased positive and any materials 801, 802 on the electrode form the reaction surface.

Please replace paragraph [0109] as follows:

[0109] When the injector is an optical generator where the optical radiation impinges directly on the thin conductive reaction surface 109 either from behind or from the front, then the impinging creates hot electrons. The conductive reaction surface 109 has thickness dimension of order less than approximately three diffusion lengths for hot electrons. The thin conductive reaction surface and any materials 801, 802 on the electrode form the reaction surface. When the injector is an optical generator where the optical radiation impinges on a semiconductor, the impinging creates hot carriers in the semiconductor 108 which diffuse to an appropriately thin conductive electrode surface 109. The electrode may or may not be deliberately biased using external energy sources. The electrode and any material 801, 802 on the electrode form the reaction surface.

Please replace paragraph [0112] as follows:

[0112] The surface to receive hot electrons includes a conductor 109 with thickness dimension less than three diffusion lengths for hot electrons. In one embodiment, the surface 109 and the reaction surface 801, 802 are part of the same element. On one side, e.g., the side facing the element 108, electrons may be generated and on the other side, e.g., the side facing the reaction volume containing the fuel and oxidizers, chemical specie impinge on the surface 109, 801, 802 and adsorb, react or otherwise interact. The thickness dimension is measured from the side facing reacting gas or materials to the side interfacing with the injector 108. This dimension is generally designed to be less than three times the diffusion length for hot electrons. E.g., this dimension is of order 10 nanometers or more for gold, silver, and aluminum.